

# Wisconsin's Forestry Best Management Practices for Water Quality

1995 - 2005





*This headwater segment of a small southern Wisconsin perennial stream is designated Category 5 trout water. Forestry operations near such waters must be consistent with various regulations, and Forestry BMPs should be used, such as establishing a riparian management zone.*

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## Foreword

Wisconsin's Forestry Best Management Practices (BMP) for Water Quality Program has been in place for ten years. From 1995 to 2005, this voluntary program has made remarkable strides in adapting forest operations across the state so that they are not only sustainable, but promote the protection of our state's water resources as well. To commemorate this ten year anniversary, we are highlighting the accomplishments of the Forestry BMP Program since its inception. We hope that this document not only illustrates the success of the program, but also promotes the use of Forestry BMPs in as many aspects of forest management as possible. We look forward to the next ten years of the program and are confident that they will be even more successful than the first ten.

# Best Management Practices – Program Development

Wisconsin's Forestry Best Management Practices (BMPs) are designed to protect water quality by minimizing nonpoint source pollution from forestry activities. Section 208 of the 1977 Clean Water Act prompted the development of this program by requiring each state to develop plans and procedures to control "silviculturally related nonpoint sources of pollution...to the extent feasible." In addition, Section 319 of the 1987 Water Quality Act required that each state develop and implement a program to reduce nonpoint source pollution to the "maximum extent practicable."

Nonpoint source pollution occurs when surface water runoff from rainfall or snowmelt moves across the ground, picking up and carrying pollutants into streams, lakes, wetlands and groundwater. Nonpoint source pollution results from a variety of activities in Wisconsin, including fertilizers from agricultural land and residential areas; toxic chemicals from urban runoff and energy production; sediment from improperly managed construction sites, croplands, and forest lands; and bacteria and nutrients from livestock and agriculture. It is estimated that only about three to five percent of the state's nonpoint pollution comes from forestry activities on Wisconsin's 16 million acres of forest lands. Nevertheless, individuals involved with forest management activities in Wisconsin are committed to protecting the state's water resources. Nonpoint source pollution is now regarded as the largest remaining pollution threat to Wisconsin's waters, so this commitment from forestry professionals to protect Wisconsin's waters through the use of Forestry BMPs is quite remarkable.

The BMP development process began in the late 1980s and early 1990s. In 1990, the Wisconsin Department of Natural Resources (DNR) Bureau of Forestry and the Wisconsin Paper Council prepared the first "Forest Practice Guidelines for Wisconsin" brochure. In May 1992, the Lake States Forestry Alliance hosted a 'Forestry Practices and Water Quality Workshop'. At the workshop, four BMP committees were established: definitions, monitoring, education and training, and finance. The committees included people from various interests and backgrounds to ensure that the BMPs were reasonable, achievable, and cost effective.

After several years of hard work to develop the program, Wisconsin's Forestry Best Management Practices for Water Quality Program officially began in the spring of 1995 with the publishing of *Wisconsin's Forestry Best Management Practices for Water Quality: Field Manual for Loggers, Landowners and Land Managers*. The program is based on *voluntary* best management practices – this is believed to be the most practical and cost effective means for protecting water quality and complying with federal legislation. The field manual was reprinted in August 1997 and May 2003. Minor changes were made to the field manual for clarity and to provide more information. The BMPs that are included in the manual have remained the same since the first edition was published and the program began.

The BMP program is voluntary, but it is important to note that there are several circumstances for which compliance with Best Management Practices is required. State forests (DNR owned properties), county forests, and private lands that have enrolled in the Managed Forest Law since 1995 must comply with the standards of the BMP program. In addition, the certification of forest lands as sustainably managed will further require the use of Forestry Best Management Practices for Water Quality.



*The area of aspen-birch and other “pioneer types” has declined over the last 70 years. These sun-loving species require the open conditions created by a windstorm, fire or a forestry practice such as an even-aged harvest to regenerate and grow.*

# Education & Training Workshops

BMP workshops are a crucial component to the program, as they clarify how, where, and when to appropriately apply Forestry BMPs. The first BMP workshops were hosted by the DNR in 1994 and in October 1997, the Forest Industry Safety & Training Alliance Inc. (FISTA) began hosting these workshops in cooperation with the DNR.

Attendance at BMP workshops has grown (Table 1). There have been more than 150 workshops held around the state with about 5,400 attendees. A typical workshop usually consists of a morning classroom session in which BMPs are introduced and explained, and an afternoon field session illustrating potential water quality impacts from forest practices.

**Table 1. Summary of Forestry BMP Education & Training Workshops 1994-2005.**

Year	# of workshops held	# of attendees
1994	4	183
1995	10	560
1996	6	276
1997*	12	441
1997	3	117
1998	14	417
1999	23	1119
2000	10	327
2001	8	202
2002	18	544
2003	11	399
2004	17	454
2005	15	361
<b>TOTAL</b>	<b>151</b>	<b>5400</b>

\* Prior to 1997, training was provided by the DNR. Since that time, FISTA has hosted these workshops.

While the program is voluntary, there are many circumstances for which participation in BMP training is required. For example, loggers are required to complete BMP training at least once to comply with Sustainable Forestry Initiative (SFI) standards. Although professionals in the industry are the most common attendees to the workshops, landowners are encouraged to attend as well. If you are interested in attending, please go to the following websites to see when and where future workshops will be held.

- <http://dnr.wi.gov/org/land/forestry/Usesof/bmp/bmpworkshops.htm>
- <http://www.fistausa.org/workshops-schedule.html>



*During the field portion of BMP workshops, groups visit timber harvest sites to discuss BMPs and potential impacts to water quality.*

# BMP Monitoring

## Background

Monitoring Forestry Best Management Practices began in 1995 shortly after the program began. The monitoring process consists of teams visiting and evaluating timber sales for BMP application and effectiveness in various locations throughout the state. The teams are comprised of people with a wide variety of backgrounds, including people from county, state, and federal agencies, University of Wisconsin Extension, professional forestry organizations, environmental and conservation organizations, and the timber, pulp, and paper industries. A DNR or U.S. Forest Service (USFS) forester typically serves as the leader for each team. Teams walk each site thoroughly and examine all aspects of the implementation of Forestry BMPs.



*A monitoring team audits a timber sale.*

Since 1995, nearly 500 timber sales have been monitored for their BMP application and effectiveness (Figure 1). To select the monitoring sites, a database of timber sales for a particular landowner category (county, federal, private industrial, private non-industrial, state, or tribal), is compiled and randomly ordered. The sites are then checked against the monitoring eligibility standards:

- At least one acre of harvesting was on a wetland; or
- The sale was conducted within 200 feet of a lake, river or stream; or
- A significant length of wetland was crossed during the harvest.

A minimum number of sites for monitoring is pre-determined so that statistical validity can be achieved across the state.

The objectives of the monitoring program are:

1. Determine the extent to which BMPs are being applied throughout Wisconsin.
2. Determine the effectiveness of properly applied BMPs in protecting water quality.
3. Determine the effects of not applying BMPs where needed.
4. Obtain descriptive information about Riparian Management Zones (RMZs) and buffer strips with respect to size, vegetative composition and past use.

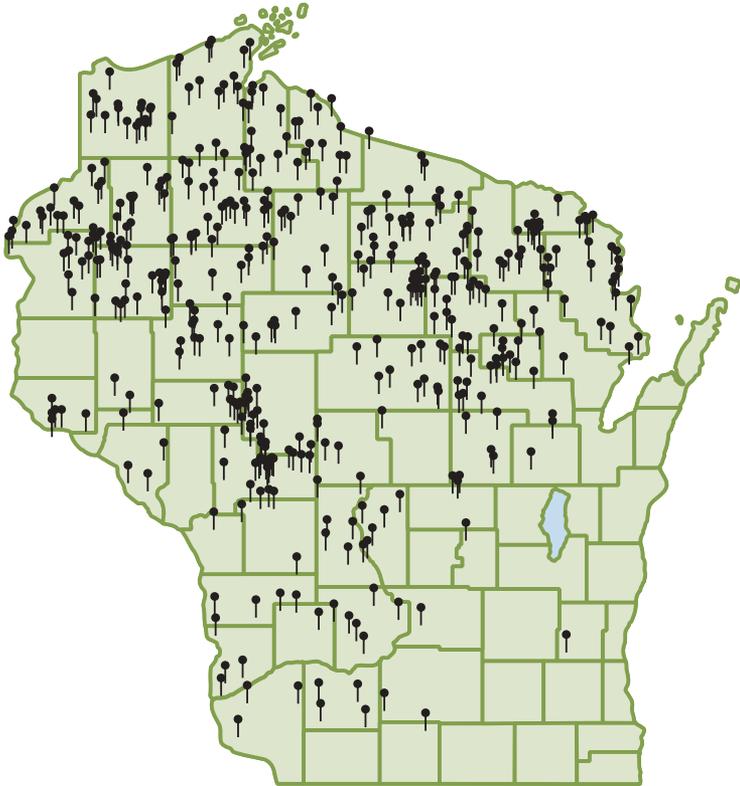


Figure 1. Locations of timber sales monitored from 1995 - 2003.

## History of BMP Monitoring

The first monitoring cycle was completed before the BMP field guide was published and before training was widely offered. It obtained baseline data to compare against future monitoring data.

BMP monitoring in 1995-1997 focused on all landowner categories in the northern regions of the state, where the majority of forest lands and forest operations occur. In 1999-2001, non-industrial private forest (NIPF) lands in the Driftless Area of Wisconsin were monitored. Because it was never glaciated, this area is dominated by unique landscapes and water resources. The distinctive nature of the Driftless Area and its water resources made it an appealing target for BMP monitoring.

In 2002, BMP monitoring focused on all landowner categories across the state. A new addition to the process was the completion of a cost analysis of monitoring. Costs were divided into five categories: aerial surveys, cutting notices, BMP workshops, NIPF field checks, and monitoring teams. Because the BMP program is voluntary, it is important to complete cost analyses such as these in order to determine how to use money in the most efficient way possible while still achieving the goals of the program.

In 2003, a multiphase monitoring scheme was developed. With this method, monitoring is done in terms of landowner categories, with one or two categories being audited each year. Larger sample sizes for each landowner category allow more useful results for comparison purposes and statistical analysis. In 2003 county forest and state DNR lands were monitored.

## Results

Since 1995, nearly 500 timber sales have been monitored for BMP application and effectiveness. The landscapes and BMP needs vary tremendously from site to site (Table 2). Site characteristics and BMP use can have a variety of impacts on water quality. BMP monitoring makes it possible to look at these issues and see what practices are effectively protecting water quality and what areas need more help.

**Table 2. Site characteristics of monitored timber sales from 1995 - 2003.**

Site feature	# of timber sales
Bridge	13
Pipe culvert	14
Ford	8
Temporary stream crossing	10
Wetland	271



*A ford was appropriate for this stream crossing because the stream banks are low, and the streambed is gravel.*



*Pulpwood stacked above the culvert elevates this forest road, and reduces the approach grade at the stream crossing. This helps minimize erosion potential from water runoff.*



*Wetlands were found on over half of the sites monitored from 1995 - 2003. This photo depicts a forested wetland in the Brule River State Forest.*

Cumulatively, BMP compliance for the past ten years (8 years of monitoring) is 83%. This means that 83% of the time, Forestry BMPs were applied correctly where needed. The overall BMP effectiveness has also proven to be impressive—when BMPs were applied correctly where needed, no adverse impacts to water quality were found 99% of the time. This shows the true benefit of implementing the BMPs. Equally important is that when Forestry BMPs were *not* applied where needed, adverse impacts to water quality were observed 71% of the time, usually with minor long-term impacts. These numbers confirm the importance of the Forestry BMP Program in protecting water quality and the continued need to improve BMP application. Future goals of the program involve identifying opportunities for improvement and continuing to protect our state’s water resources (Table 3).

**Table 3. Summary of Forestry BMP monitoring data from 1995-2003.**

Year	'95	'96	'97	'99	'00	'01	'02	'03	Total/ Average
# of sites monitored	84	115 <sup>2</sup>	96	11 <sup>3</sup>	19	7	85	60	477
overall BMP compliance <sup>1</sup> (%)	84	85	85	77	84	66	86	92	83
overall effectiveness (%) when applied correctly (no adverse impact to water quality)	99	100	100	99	100	98	99	100	99
frequency (%) of adverse impacts to water quality when BMP <i>not</i> applied where needed	68	63	56	71	70	100	75	70	71

<sup>1</sup> Compliance refers to BMPs applied correctly where needed  
<sup>2</sup> 8 of the 115 sales were readuits of 95 monitoring; 8 of the 1997 sales were also readuits  
<sup>3</sup> The 11 sites in the 1999 monitoring period were not located randomly and hence numerous potential biases result. The data was not included in any summary because of this. Only trends can be inferred.

Looking at the results from various landowner categories (Figure 2), federal and tribal lands have the highest BMP compliance rates, and non-industrial private forest landowners have the lowest compliance rates (Table 4). More attention should be placed on these landowners to determine why BMP application rates are lower and how to improve them.

**Table 4. Frequency (%) of correct application of BMPs where needed for each landowner category.**

Landowner category	1995	1996	1997	2002	2003
Tribal	NA	96	97	93	NA
Federal	94	96	84	96	NA
State	81	85	94	100	90
County	86	87	87	89	93
Private Industrial	90	89	95	95	NA
Private Non-Industrial	81	82	82	81	NA

\*2000-2001 monitoring did not analyze data according to landowner category.



*Riparian areas, such as this shoreline along the Peshtigo River, maintain streambank, channel and shoreline stability as well as stream temperature and water quality.*



*Working with a forester may help NIPF landowners realize that their land can be managed sustainably for many goals and objectives. Frequent communication between the forester, landowner and other resource professionals helps insure that management objectives are fully achieved.*

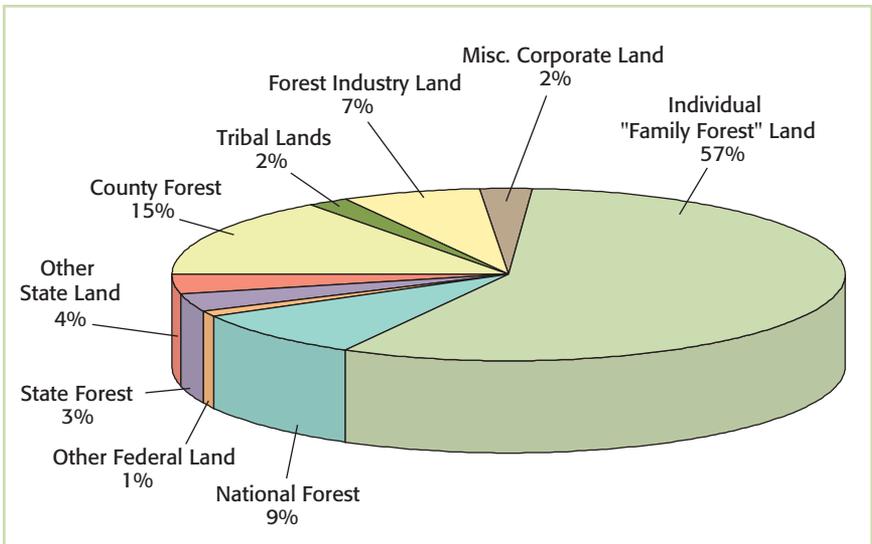


Figure 2. Forest acres by ownership category (1997).

Categories of Forestry BMPs have also been analyzed (Table 5). This type of analysis identifies which BMP categories have the lowest compliance and warrant future attention. Fuels, Lubricants, Waste and Spills and Timber Harvesting categories have the highest compliance whereas Forest Roads and Skid Trails have the lowest. This information is very important to focus training and enhance knowledge of specific Forestry BMPs that need attention.

**Table 5. Frequency (%) of correct application of BMPs where needed for each BMP category.**

BMP category	1995	1996	1997	2000-2001	2002	2003 county	2003 state
Fuels	93	90	94	94	98	97	97
RMZs	78	82	84	77	85	91	96
Forest Roads	80	79	76	73	80	96	71
Timber Harvesting	90	92	89	74	94	96	99
Skid Trails	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	72	69	78
Wetlands	85	86	87	60	84	96	91

<sup>1</sup> Skid trails had not yet been separated from timber harvesting BMPs.



*Careful planning and control of the logging operation can protect visual quality, as well as water quality, following a timber harvest.*



*Maintaining forest roads helps prevent erosion. This grader is shaping the road surface so that water runs off properly.*

It has also been found that specific Forestry BMPs have continually shown up as “not applied where needed.” It is important that these are evaluated, because it may provide insight as to which BMPs may need to be altered so that they are more effective, or which BMPs could be removed because no adverse impacts to water quality are observed when they are not applied.

For example, two of the BMPs that were most commonly not applied throughout most of the program show that for some BMPs, non-application appears to have no impact on water quality, whereas for others, minor long-term impacts tend to be seen when they are not applied (Table 6). Future attention may suggest that the first instance would possibly involve removing that BMP, and the second instance would involve determining how this BMP can be changed so that it will be better implemented and reduce its cause of minor long-term impacts to water quality.

Table 6. Two Forestry BMPs that were most commonly not applied across the ten years of the program and the frequency (%) of adverse impacts on water quality due to non-use.

*Do not operate wheeled or tracked harvesting equipment within 50 feet of the ordinary high water mark except on roads or at stream crossings.*

	no adverse impact	minor short-term impact	minor long-term impact	major short-term impact	major long-term impact
1995	78	17	6	0	0
1996	64	20	16	0	0
1997	100	0	0	0	0
2002	55	9	36	0	0
2003 county	60	20	20	0	0
2003 state	100	0	0	0	0
<b>average</b>	<b>76</b>	<b>11</b>	<b>13</b>	<b>0</b>	<b>0</b>



*The RMZ is a strip of land alongside streams and lakes beginning at the ordinary high-water mark, and extending 35 or 100 feet landward.*

*Do not move slash into or pile slash within RMZ. Keep slash out of lakes and stream channels and away from areas where it may be swept into the water.*

	no adverse impact	minor short-term impact	minor long-term impact	major short-term impact	major long-term impact
1995	31	23	46	0	0
1996	7	21	71	0	0
1997	14	0	86	0	0
2002	33	8	58	0	0
2003 county	0	0	100	0	0
2003 state	0	0	0	0	100
<b>average</b>	14	9	<b>60</b>	0	17



*Slash should not be piled in RMZs or wetlands. Slash piled in a wetland, as shown here, may disrupt the hydrology and impede surface water flow.*

# BMP Advisory Committee

In November 2001, the Wisconsin Department of Natural Resources convened an external BMP Advisory Committee intended to provide leadership, advice, and guidance to promote the long-term success of the Forestry BMP Program. The committee represents a variety of interests and backgrounds, with members from the following organizations:

- 1000 Friends of Wisconsin
- International Paper
- Lake States Lumber Association
- Society of American Foresters
- Stora Enso North America
- The Nature Conservancy
- Timber Producers Association
- U.S. Forest Service
- Wisconsin Association of Lakes
- Wisconsin Council on Forestry
- Wisconsin County Forest Association
- Wisconsin Paper Council
- Wisconsin Professional Loggers Association
- Wisconsin Woodland Owners Association

The Committee met seven times from 2001 to 2004. During the course of those meetings, the Committee evaluated and gave the DNR feedback on critical issues such as BMP monitoring, updating the BMP manual, and developing successful education and training programs. The input that the committee has provided the DNR with has been invaluable in promoting the success of the Forestry BMP Program.

The initial charge of the Committee was to help formulate the BMP monitoring strategy for 2002 and beyond through the following objectives:

1. Consider revising Wisconsin's statewide monitoring strategy for Forestry BMPs (vs. 95-97 monitoring)
2. Develop a procedure for identifying and updating BMPs that need revision
3. Develop a procedure for communicating BMPs and adaptations through education and outreach strategies

In 2003, the Committee continued to assist in the Forestry BMP monitoring effort by contributing to the development of the multi-phase monitoring scheme.

The DNR continues to seek advice and guidance from the BMP Advisory Committee on future directions for the Forestry Best Management Practices Program. In 2005, the DNR invited additional representatives from the following organizations:

- Forest Industry Safety & Training Alliance
- River Alliance of Wisconsin
- Sustainable Forestry Initiative Implementation Committee
- Trout Unlimited
- Wisconsin Wetlands Association

The Committee provides valuable input on the future of the Forestry BMP Program, including options for future BMP monitoring efforts, potential revisions to the Forestry BMP manual, and suggestions for a 5-year outreach plan for training, publications, and other products. Advisory Committee meetings also provide the Forestry Division with an opportunity to share information on other initiatives within the Division and the Department that may interest Advisory Committee members.



*Autumn in the Baraboo Hills showcases the diversity found in a mixed pine and hardwood forested landscape.*

# Summary & Future Directions

Wisconsin's Forestry Best Management Practices for Water Quality Program has been quite successful in its first ten years of



existence. Many strides have been made in terms of educating individuals about how forestry practices relate to water quality, and applying principles of water protection to those practices. When Forestry BMPs are applied where needed, they prove to be very successful at avoiding adverse impacts to water quality.

The future of the program seems to be bright as well. Using information from the eight years of monitoring, changes and updates to the program are currently being considered. These changes will address the issues discussed in this document, such as modifying or removing BMPs that are currently not being applied often enough. In addition, changes are being

considered for education and training workshops as well.

Additional "advanced" level workshops may become available to address some of the more complicated issues encountered during timber harvesting activities.

The forests of Wisconsin are an invaluable resource not only for the timber industry, but for wildlife, recreation, aesthetics, and many other landowner objectives as well. Forestry Best Management Practices for Water Quality have promoted the management of those forests in an environmentally healthy and sustainable way that also protects water quality. As the program continues to evolve and change, its accomplishments will grow as well. Please continue to stay informed about Wisconsin's Forestry Best Management Practices for Water Quality Program by visiting the Wisconsin DNR's BMP homepage at:

- <http://dnr.wi.gov/org/land/forestry/Usesof/bmp/bmp.htm>

## Wisconsin's Forestry Best Management Practices Program

# TIMELINE

<b>1972</b>	Water Pollution Control Act passed
<b>1977</b>	Clean Water Act amended
<b>1987</b>	Water Quality Act passed
<b>1990</b>	"Forest Practice Guidelines for Wisconsin" brochure produced
<b>May 1992</b>	Forestry Practices and Water Quality Workshop held
<b>January 1993</b>	BMP committees created
<b>October 1994</b>	First BMP Education & Training Programs held
<b>1995</b>	BMP program officially began First BMP monitoring completed in northern Wisconsin
<b>March 1995</b>	<i>Wisconsin's Forestry Best Management Practices for Water Quality: Field Manual for Loggers, Landowners and Land Managers</i> published
<b>December 1995</b>	Forestry Facts published
<b>1996</b>	BMP monitoring completed in northern Wisconsin
<b>1997</b>	BMP monitoring completed in northern Wisconsin
<b>August 1997</b>	2 <sup>nd</sup> edition of BMP field manual published
<b>October 1997</b>	FISTA began hosting BMP workshops
<b>October 1999</b>	Monitoring conducted in the Kickapoo River Watershed
<b>Fall 2000</b>	Monitoring conducted in Driftless Area; continued in Kickapoo River Watershed
<b>Fall 2001</b>	Kickapoo River Watershed monitoring completed
<b>November 2001</b>	BMP Advisory Committee assembled
<b>2002</b>	Guidelines for revising BMP field manual created BMP monitoring completed statewide
<b>2003</b>	Multiphase monitoring of BMPs began
<b>May 2003</b>	3 <sup>rd</sup> edition of BMP field manual published
<b>October 2003</b>	<i>Wisconsin Forest Management Guidelines</i> published integrating Forestry BMP information



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